

FINTECH COLLABORATION AND PERFORMANCE OF COMMERCIAL BANKS IN  
KENYA.

BY

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## **DECLARATION**

This research project has not been submitted for examination in any other university and is my original work.

Signature.....

Date.....

This research project has been submitted for examination with my approval as University Supervisor.

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## **AKCNOWLEDGMENT**

My Supervisor Prof. Kate Litondo. Your alacrity and wisdom is during the entire time writing this research project has been unparalleled. I would also like to acknowledge other Lectures and fellow classmates, who have always been positive and supportive. I owe my success to your sacrifices.

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## **DEDICATION**

### **My Family**

My Parents, for the moral and emotional support. For persistently encouraging me to always chase my dreams. My sibling Andrew, Antony, Michael and Emmanuel who continue to be my pillars of strength.

### **My friends and colleagues**

Your emotional and moral support has been steadfast. May God Bless you.

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## **ABBREVIATIONS AND ACRONMYNS**

ATM	Automated Teller Machines
DEA	Data Envelopment Analysis
TE	Technical Efficiency
ESH	Efficient Structure Hypothesis
TAT	Technology Acceptance Theory

## **ABSTRACT**

As Fintech innovations continue to alter the landscape in the banking sector, banks in Kenya are forming collaborations that are envisioned to shape delivery of services. This study investigates the influence of Bank-Fintech collaborations on a bank's efficiency using the data envelopment model with input-orientation based on the intermediation dimension. Efficiency scores are decomposed as technical efficiency. Secondary data for the period 2009-2018 is extracted from banks sampled from total population of 44 banks in Kenya. Technical efficiency is calculated based on Pre Fintech and Post Fintech times based on four Intermediation Models anchored on Deposits, Loans, Interest Income and Interests Expense as inputs and Outputs.

# CHAPTER ONE: INTRODUCTION

## 1.1. Background of the Study

Technology based Innovations continue to change how we do our work, how we socialize, how we share information, and otherwise mingle with other people and the world around us. Huge opportunities are realised across various industries, financial services included as a result of these changes (Ouye, 2011). Even though recent innovative technologies, ATM and electronic trading, for example have for some time now informed commercial banks IT infrastructure, the mix of a post-financial crisis regulatory ecosystem and a vast emergence of technological changes which include the expeditious proliferation of technologies like AI, smart phones and large data analytics – has greatly affected the manner commercial banks work. (Adewoye 2013). This context has made it easier for financial technologies to eat into the banking industry market space and are offering products and services first hand to consumers and businesses.

Additionally, Commercial banks are constantly and aggressively investing in innovation. Regulators have to constantly seek to keep abreast with these new technologies in order to robustly support innovation in advancement of important policy objectives. They must also collaborate with Fintechs innovators to allay potential risks. (Business Daily 2018)

### 1.1.1 Fintech Collaborations

KPMG (2017) defines Fintechs as businesses that apply technology to alter how financial services are provided to end clients. These businesses are devoted to high quality

achievements, better clients' experiences and an explicit ability to outdo competition in the market place..

The world Fintech Report 2018, defines Bank-Fintech Collaborations as partnership between the two entities in terms of venture investing, mergers and acquisition to corporate start up engagement programmes with the view of bringing a synergy of strengths together to create an entity that either individual unit could realize on its own. How a corporation plans to associate with others, its ecosystem, the environment and other companies around will greatly shape how well that corporation will thrive and adapt in an ever-changing environment (IIF, 2017).

In engaging with Fintechs, Banks will be better placed to drive down costs, innovate and enhance customer experience. At the same time, Fintechs would immensely benefit from already existing banking ecosystems thereby driving down their costs of customer acquisition. EY (2017)

### **1.1.2. Bank Performance**

Efficient structure hypothesis (ESH) argues that the most efficient organizations lead the pack in their respective operational spaces edging competition and growing as a result. ESH further notes that a bank's structure grows due to superior working efficiency and a positive relationship between existing market structures and organizational profit. This consequently leads to a raise in market concentration (Molyneux and Forbes, 1995). Demsetz (1973) argues that the structures of organisations are determined by its systematic structure and ability to secure more market share consequently translating to a higher

market strength. Efficiency comes ahead of market strength in the banking system as it lowers its operating costs and is able to expand market share leading to elevated market strength (Moyo, 2018).

These financial entities are viewed as technically efficient if they are able to arrive at given sets of outputs utilizing the least conceivable amount of inputs (Abel and Bara, 2017). The Data envelopment analysis (DEA) model estimates efficiency as applied from two types of perspectives.

A firm would be having an increasing or decreasing return to scale if the output increases or decreases respectively more than the inputs. For increasing return to scale, the firm is faced by the challenge of under sizing thus should increase its size (Abel and Bara, 2017). For the decreasing return to scale, the firm is extremely large above its optimal size. Altering returns to scale would indicate that the firm is operating outside the optimal scale. A constant return to scale if the output changes proportionately with an increase or decrease in inputs, hence the firm is scale efficient (Abel and Bara, 2017).

### **1.1.3 Commercial Banks in Kenya**

Central Bank of Kenya supervises all commercial banks in Kenya. Through its prudential guidelines, CBK focuses on formulation, implementing monetary policies with the view of attaining, and ensuring realization of a stable market based financial systems. Today there are 44 Kenyan commercial banks (see appendix I). 30 of the 44 banks are owned locally with 14 being foreign owned. (CBK Supervision Annual Report 2017). In recent times though, Kenyan Banks have gone through a challenging time following the enactment of

legislation on interest rate capping, harsh weather situations, drought and a continuous and chaotic electioneering period. (CBK Supervision Annual Report 2017) These conditions have adversely influenced the banks pricing of credit and deposits. Other sectors of the economy have similarly been hard hit by adverse weather conditions and unfavorable political environment, consequently affecting lending in the sectors. As result and in a quest to remain competitive, there has been substantial concerted effort by commercial banks to diversify by getting into the digital lending space (Daily Nation 2019). Other technological frontiers that the banks have ventured into and in conjunction with Fintechs include Open banking, Mobile Money, Online Banking, Automation of internal processes, cyber security and Fintech regulation that has seen CBK is geared towards setting up a Regulatory Sandbox for Fintechs. (Nairobi Business Monthly 2018).

## **1.2 Research Problem**

Undoubtable disruption to commercial banks has been triggered by the large scale and abrupt occurrence of Fintechs. Demertzis, Merler, and Wolff, (2017). Companies like Google, Branch, and Amazon are already regarded as Fintechs despite not fully having penetrated the Market. These firms are strategically placed since they are exposed to an enormous of customer data and can easily interface with them on matters financial services. There are over 38 Fintech firms in Kenya as at the end of 2017. These Fintechs have continued to struggle standing on their own and competing against the big and established industry players (EY 2018).

Bank and Fintech collaborations can develop a convergence node between both players to close the gaps between the previously separated market players, to drive this disruptive

revolution (EY, 2018; Accenture, 2016), and to shift the efficiency and market power in the banking field (FSB, 2019). Fintech in poorly developed financial markets fill the existing gap in provision of financial services (Carmona et al., 2018), and can alter the efficiency and improve service delivery and access (World Bank, 2017). In the world, financial industry efficiency in Sub-Saharan Africa is the lowest and Fintech can alter this scenario (IMF, 2019). A need exists to increase a bank's operations to operate at most productive scale and reduce the poor utilization of inputs (Abel and Bara, 2017; Singh and Fida, 2015). In Kenya, since 2015, the bank's employees continue to decrease even with an increase in number of deposit accounts opened (CBK, 2017) and the possible reason is the intermediation process has received a boost from the Fintech and bank collaborations. In Kenya, Fintech and bank collaborations go back to 2011 and will continue to be embraced. This study will investigate if Fintech has had an influence on bank's technical efficiency. An analysis of the Kenyan banks technical efficiency will be presented using DEA technique to estimate the influence of Fintech and bank collaboration and how they affect efficiency in the banking sector by optimizing inputs for a productive operating scale.

### **1.3 Research Objective**

This research was primarily meant to evaluate collaborations between Fintechs and Banks in Kenya specifically;

- a) To determine the degree to which Fintechs have collaborated with the banks.
- b) To determine the effect of Bank - Fintech collaborations on the technical performance of Kenyan commercial banks.

#### **1.4 Value of the Study**

Findings emanating from this research will make additions to the known literature on the technical performance of banks as confronted by the impact of Fintech collaborations as study variables. The research output will be a source of invaluable literature among the study variables on theories and policies that inform them.

Additionally, the research will be vital to the regulator as they endeavor to build regulatory frameworks around Fintechs and their operational space in the Kenyan economy.



## **CHAPTER TWO: LITERATURE REVIEW**

### **2.1 Introduction**

This chapter captures a critical review of theoretical concepts to discuss the theory of technology acceptance, the theory of financial intermediation and institutional theory. The empirical review summarizes concepts on Bank-Fintechs collaborations and financial performances.

### **2.2 Theoretical Foundation**

This section discusses the theory of financial intermediation, institutional theory and the technology acceptance theory.

#### **2.2.1 Theory of Financial Intermediation**

Financial Intermediation entails movement of reserve funds from economic corporations with extra amounts to those that require those funds. The theory depends on the notion of resource issuance and is premised on complete and perfect markets. This market imperfection as caused by information asymmetry results to particular types of monitoring and transaction costs (Merton 1995). Financial institutions then have to ensure reduction of adverse selection through screening and adopting debt monitoring mechanisms with the primary aim of reducing moral hazards in financial markets. The second perspective of the theory converges on the transaction costs. Financial institutions try to lower transaction costs that are realized by economic units trading directly with each other when these units take advantage of economies of scale. The mode of regulation employed to regulate investments and savings in the economy makes the third argument. Regulation may for

instance needs financial institutions to retain liquidity levels that are above the identified threshold and prescribed ratios of deposits to capital (Andries & Cuza, 2009). The main reviewers of this theory argue that a substantial number of corporations have advanced various types of securities and it is vital for the theory to stick. The actuality of continuous time approaches for option pricing models for example the Scholes and Black models and the addition of the ultimate equilibrium theory of regulating prices try to negate these criticisms. In most technologically advanced financial markets, dynamic trading of financial assets allow the markets to successively compete even where fewer number of financial institutions and securities exist.

Both banks and Fintechs issue financial intermediation services in their own ways. The Fintechs have utilized transformations and technology to avail financial utilities at affordable transaction costs, more efficiently and conveniently. They also are much less regulated as compared to commercial institutions. Banks on the other hand have over the years traditionally provided intermediation services and have well developed networks, presence and market share. This research consequently tries to identify what effects does collaboration between the two entities in Kenya, in the banking sector, yield.

### **2.2.2 Technology Acceptance Theory**

Technology Acceptance Theory (TAT) as presented by Davis, Bagozzi and Warshaw (1989) examines the conceptual model that interrogates the extent to which new technology has been adopted or user intention to use these new information systems. TAT design is based on perceived ease and utility of the new technology. The utility of these new

information systems as perceived by the users fundamentally rides on their persuasion and belief that the level of job performance is enhanced by use of these information systems (Baker et al., 2015). TAT has put more emphasis on the manner perception on alleviation of application of new information systems directly impacts recognized convenience of technology.

Luarn and Lin (2003) merged rust and TAT to realise a new model, which expounds on consumer way of conduct when utilizing technology in the online space. Pavlou (2003) developed an acceptance framework for e-commerce. It proposes segregation and utilization of experimental designs and surveys. Follow up research work done by Horst, Kuttschreuter and Gutteling (2007) deliberates on whether Dutch government should avail an electronic platform for its citizenry for purposes of accessing government utilities like those that other governments do. TAT factors embraced by the study include perceptions on faith, risk and experiences of the Dutch people. Closer home, The Government of Kenya, GoK recently rolled out the National Integrated Identity Management (NIIMS) that was meant to be a single source of a citizen's data for ease of access to such information when offering government services and to be a pre-requisite for accessing government services. Linda Bonyo, CEO and Co-Founder Lawyers Hub Kenya raises concerns she perceives on data leakage and breaches that citizens are exposed to due to lack of data framework legislation as some the reasons they have not registered for this government initiative. She observes for example Kisumu, a major town in Kenya the registration process stalled following unclear circumstances associated with poor government facilitation. CIO East Africa (2019). These instances do not merely explain new

technologies are accepted and adopted but also observes that TAT is well placed in expounding the way of conduct of online users of these information systems. (Pavlou, 2003; Horst et al., 2007). It is a crucial theory that supports this research on how Fintech-bank collaborations influences how commercial banks in Kenya perform. Just like the acceptance of the growth and value addition of Fintechs, it is upon banks to leverage on the technological capacities of these Fintechs and collaborate and ultimately the product of this collaboration accepted by the customer and/or end user.

### **2.2.3 The Institutional Theory**

This theory asserts that institutions are social structures with norms and belief systems, which have to attain a high degree of resilience. Institutions have a big operational scope. They manifest varying levels of jurisdiction, from an organized and systematic world to another with localized interpersonal relationships (Luonsbury, 2008). Institutional theory further investigates the social structure and prefers the mechanisms through which structures such as norms, schemes, routines and rules are inculcated and accepted as societal standards of behaviors in organizations (Scott, 2004). Banks undergo restructuring such as mergers, acquisitions and collaborations in order to diversify and issue utilities to new clients break into new markets and remain competitive. Restructurings facilitates an organization to change their form and structure in order to work more successfully. In order to stay afloat and obtain a competitive edge within their ecosystems, organizations must observe the rules and belief systems that exist in their environments. This is because isomorphic institutions, both as a result of structure or procedures, good and services

offered by the firms included, tend to earn organization legitimacy. (Scott 2004). A good example would be Multinational companies conducting business in many countries and jurisdictions tend to encounter divergent pressures and are expected to restructure taking into consideration the particular country circumstance including their ownership structure. The competitive strategy in every economy tends to be shaped by pressures in the host jurisdictions and domestic corporations environments, which tend to exert consequential impacts in such economies. Knetter (1989) observed that companies in different economic jurisdiction respond asymmetrically to similar challenges (Economic, political and social factors) which constitute an environments institutional structure that confers firms with benefits for engaging in specific duties.

Institutional Theory therefore asserts the need for firms to conform and adapt to their environments. With the advent of new technology, easy access to this technology through mobile phones and the internet for example, growth of Fintechs that have attempted to take advantage of these environmental changes, Bank must comply with the current social structure and behaviors in the environment.

### **2.3 Fintech- Bank Collaborations**

According to a KPMG report (2015), Fintechs offer personalized services and communicate collectively with clients, enhancing customer experience and engagement. The application of technologies such as AI and big data analytics to issue predictive forecast has also placed Fintechs in a good place to offer support and guide corporate strategy. Trust is the cornerstone of the financial utility corporations. Fintechs allow

financial services corporations to elevate clarity of products and services, and issue transparency on charges and fees. Broken promises and system outages in local branch closures, fines and regulatory scandals have flawed banks' reputation and their capability to continue customer's long-term trust. McKinsey & Company (2015) further argues that by employing analytics to predict susceptibility to fraud and fraud patterns, Fintechs have been able to provide security to customers by mitigating against online-related risks of fraud and cyber-attacks. Fintechs have successfully attempted to provide simple products at lower costs and helping underbanked with innovative solution, IIF (2017). But the potential to get a substantial share of the market has been hampered by capital constraints, competition from commercial banks with already established and wide networks and lack of adequate regulation in their financial space as compared to the banks that are governed by well laid out legal frameworks. These limitations and opportunities on both sides provide a basis for Bank- Fintech collaboration.

There is no answer on how commercial banks will apply Fintechs nevertheless; the banks will look up to Fintechs to continue innovation. The bank will cautiously review the different engagement models to select a combination that aids in long-term growth strategy of the innovation model. (Eickhoff & Weinrich, 2017) proposes a scenario where banks invest its own capital in Fintechs start-ups and Individuals with brilliant Ideas independent of outside entities but as investments in their own balance sheet. This would enable banks gain early access to innovative solutions and at the same time resolve the inadequacies of in-house talents and innovative art.

Where there is immediate need to revitalize with clients in absence of crucial resource investment and time, Banks can collaborate with Fintechs through joint ventures or co created services through contractual partnership that see each party retain its legal entity but define the mode of doing business. (EY, 2018; Accenture, 2016) Banks would be able to Utilize platforms or products made by Fintechs. Mergers and acquisition is another approach through which banks can engage and collaborate with Fintechs (FSB, 2019). Commercial banks can acquire a Fintechs company in order to increase their innovative footprint and short cut evolution of new technology. This will ensure exclusivity, acquisition of new customers at low costs, rapid routes to new markets and access to talents and innovative cultures (World Bank, 2017).

### **2.3.1 Fintech Collaborations and Performance of Commercial Banks**

Bank's capabilities and Fintechs will advance mutually beneficial relationships in the years to come as continued technological innovation continues to propel this collaboration (Indigo Sky, 2018). The Economist (2017) noted that banks are more concerned with continuity, they do not hire for transformation. Banks are neither the beginning nor the end of the value chain, so they need to act as trusted intermediary and focus on outcomes (Microsoft, 2019) so the collaborations with the Fintechs is to tap into the skills and attitudes they do not have. As the marginal utility of data increases, more added value in new services is likely to have greater implications for the market structure (FSB, 2019). The DEA model has been extensively applied in estimating efficiency in the banking sector. Lema (2017) uses the same to examine the efficiencies in the Ethiopian commercial

banks over the period from 2011 to 2014. Technical efficiency is estimated using DEA with input variables (deposit, operating expenses and interest expense) and (loan, interest income and non-interest income) for output variables. Erman (2017) carried out a research on the impact of Fintechs from an open innovative perspective. The studies established that customers were swayed with new technologies and services as offered by the new entrants. As a result, financial institutions were forced to adopt these new technologies and or collaborate with Fintechs.

A study conducted by Waagmeester (2016) on the Fintech sector in the Netherlands, reveals that increased focus on innovations of financial services has resulted to a sustained shift of financial services delivery from the conventional banks in the direction of the Fintechs. Fintechs have been more successful in developing solutions where traditional banks are struggling with their legacy and cumbersome structures and competitive character towards other banks, resulting in a lacking supporting organization, unable to effectively encourage innovative behavior (Schilling 2013).

Gorham and Dorrance (2017) explored the potential for technology innovation in the financial services sector, with sight on Fintechs. The study established that Fintechs have the ability to increase access to affordable and safe financial services to more individuals.

Sonja et, al. (2017) examined in detail the way Fintechs and financial institutions are collaborating for inclusion. The study entailed case studies of Bank- Fintech partnerships across the globe where the researchers identified corporate experts and chiefs in the



financial utility corporations, in which many constitute mainstream financial corporations and they have access many partnerships.

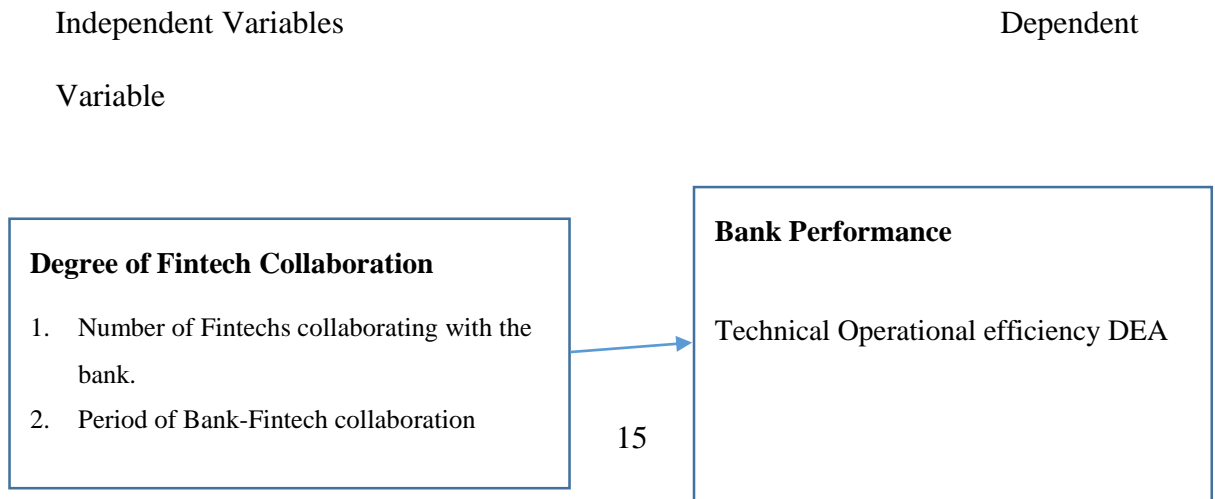
Kinuthia (2010) did a study on financial innovations. The study employed a descriptive approach. The samples size was 44 banks. A questionnaire was utilized in collection of data. The findings of the research argued that a bank long-term success is linked to its ability to innovate, acquire, possess and develop unique technological capacity.

This study is an extension of previous studies, but with the value addition of considering the influence of Fintech on banking sector efficiency in Kenya by optimizing inputs for a productive operating scale. The study will apply the DEA technique, considered two models with various combinations of output, and input variables, based on intermediation dimension.

### 2.3.2 Conceptual Framework

To attain the objectives of the study, different variables under the research were conceptualized as being in association.

Figure 2.1



#### **2.3.4 Summary of literature review**

A mutually beneficial relationship has been developing between the banks and the Fintech as strengths are offsetting one another's inherent weaknesses (Deloitte, 2018). The disruptive innovations, nonbank actors and mobile network providers (MNO) as actors in the credit market are referred to as Fintech in this study. Fintechs have the potential to hasten and fortify the gains realised in financial development in Sub-Saharan Africa in the last two decades (IMF, 2019). Banks have embraced and will continue to embrace Fintechs and consequently Fintechs are going to power the banks by changing the way banks contest each other and this has vital implications for the banking sector (Accenture, 2016; Deloitte, 2018; World Bank, 2017). Collaboration is more likely between Fintech and the financial service providers, as one Australian bank analyst postulated, "One Fintech will in due course outwit all others, then it will be outwitted by a bank" (Deloitte, 2018).

## **CHAPTER THREE: RESEARCH METHODOLOGY**

### **3.1 Introduction**

This section documents the study approach, which was employed in this study. This entailed detailed analysis, using standard metrics on gathered data. The population boundaries of the research within which data was gathered is also be defined under this chapter. An intricate deep dive to discuss the type of data to be collected, the respondents and methods for data gathering and the instruments for data gathering; and how all these are aligned to the realization of this study's objectives have been captured in this section.

### **3.2 Research Design**

Research design refers to a set of procedures applied in collection and analyzing different metrics of the items identified in the research problem. (McLaughlin, 2012). Cross-sectional survey design and methodology was employed for this study. Cross-sectional surveys are viewed as highlights of the population about which they collect data. Cross-section studies are key in identifying the number of people influenced by a specific phenomenon and whether there is a variation in the frequency of occurrence (Cherry 2018).

In regards to this study, the study sought to establish to what extent Fintech have collaborated with Banks in Kenya and how financial performance of these banks have been affected by these Bank- Fintech collaborations. Through data collection approach, Cross-sectional design was well placed to help make inference to the subject matter.

### **3.3 Study Population**

The universal groups of research of all members or set of people that a person carrying out the study tries to establish results is defined as the target population (Bryman, 2012). All the 44 entities carrying out banking dealing sector in Kenya were the target of this study. By 31<sup>st</sup> December 2018, there were four commercial banks in Kenya (Appendix I). The study also targeted one management staff in each commercial bank.

Due to the small population, a census was adopted that involved the utilization of the whole population. Cooper and Schindler (2011) define a population as a complete group of items, happenings or objects having similar features that abide by a given specification. In this case, the population comprised of 44 commercial banks, which are different from each other. Hence, a census study was suited for the study; thus, all the 44 management staff were taken as the sample size for this research.

### **3.4 Data Collection**

The research collected primary data through a questionnaire filled by the management staff in the targeted commercial banks. The researcher commenced by getting consent from the relevant authorities and especially from the administration of the various commercial banks to conduct the research.

The questionnaire was deemed as the most favorable data-gathering tool for this research since it yields a high intensity of standardization. Questionnaires were also favorable in

dropping and picking to gather information from individuals in an unobjectionable way. They gave detailed answers to complex problems (Kombo & Tromp, 2009).

The analysis also employed financial statement data for a period of 10 years, 2009-2018, using a sample of the 44 banks as defined by the population of the study. The secondary data of input variables (deposits, interest expenses, loans) and output variables (interest income, loans and deposits) was gotten from these published and publicly accessed bank financial records as shown in Tables 3.1 and 3.2.

The analysis employed financial statement data for a period of 10 years, 2009-2018, using a sample of 44 banks segmented into two groups based on post and pre Fintech collaborating Periods.

**Table 3.1: Pre and post Fintech collaboration periods.**

SN	BANK	FINTECH	PRE-FINTECH PERIOD	POST FINTECH PREIOD
1	ABC Bank (Kenya)			
44				

**Table 3.2: The DEA Variables**

SN	Variable Name	Variable Measurement
1	Deposit	The total cumulative of demand, saving and time deposit.

2	Interest expenses	The total cumulative of payment made on saving, fixed deposits and demand deposits
3	Total Loans	This includes real estate, consumer, commercial and industrial loans
4	Interest income	The total cumulative of interest on loans, advances

### 3.4 Data Analysis

Technical Efficiency scores of Banks as premised on constant-return-to-scale technique can be determined by Data envelopment analysis (DEA) (Banker, Charnes, & Cooper, 1984 Banker, R. D., Charnes, A., & Cooper, W. W. (1984). When this analysis approach is applied to multiple outputs and inputs, efficiency is defined as the ratio of weighted sum of inputs to weighted sum of outputs. The ratio's weights are calculated by the constraint that each DMU's ratio must be less than or equal to one, thus condensing multiple inputs and outputs into a single "virtual" input and single "virtual" output without providing pre-assigned weights. The efficiency score was thus determined by dividing weighted outputs by the weighted inputs. The resultant weighted efficiency scores were subsequently used to calculate the TE scores of the DMUs by solving the following efficiency-maximizing problem with variable return to scale technology assumption:

$$\text{Max } hc = \frac{\sum_{r=1}^s u_r y_{rc}}{\sum_{i=1}^m v_i X_{ic}}$$

Subject to:

$$\frac{\sum_{r=1}^s u_r y_{ri}}{\sum_{i=1}^m v_i X_{ij}} \leq 1; u_r, v_i \geq 0$$

$r = 1, \dots, S; i = 1, \dots, m \text{ and } j = 1, \dots, n$

Where  $c$  = a specific bank to be evaluated,  $y_{rj}$  = the amount of output  $r$  from bank,  $X_{ij}$  = the amount of input  $i$  to bank  $j$ ,  $u_r$  = weight chosen for output  $r$ ,  $v_i$  = weight chosen for input  $i$ ,  $n$  = number of banks,  $s$  = number of outputs, and  $m$  = number of inputs.

This study followed the examples of previous studies where intermediation approach on TE measurement was done for Banks. (Mofasa, 2007; Rosman et al., 2014).

Published Bank financial results from a Period of 2009 -2018 were collected for purposes of this study. This was primarily used to compute DEA Models as illustrated in Table 3.3. Deposit, Loans, Interest Income and Expense were used as variable for different DMU's in this study. A computation of technical efficiency was then done for both pre fintech and post fintech periods for several banks and a comparative analysis done.

**Table 3.3: Variables for the intermediation dimension**

<b>Model</b>	<b>Input Variable</b>	<b>Output Variable</b>	<b>Data Source</b>
M1	Deposit	Loans	Published Financial reports for all banks from 2009-2018.
M2	Interest expense	Interest Income	
M3	Interest expense	Deposits	
M4	Loans	Interest Income	

## CHAPTER FOUR: DATA ANALYSIS, FINDINGS AND DISCUSSION

### 4.1 Introduction

A robust analysis of findings from data collected for this study are summarized under this section. These findings are premised on the study objectives as captured under section II. The study endeavored to establish the effect of bank- fintech collaborations on the performance of the bank. The collected data was presented in tables, charts and visual diagrams after being broken down through expressive measurements.

### 4.2 Response Rate

The AAPOR Report (2015) eludes that the response rate is a ratio of the number of complete interviews with reporting units to number of eligible reporting units in a sample. For this study and as pointed out by the same AAPOR report, it was important to determine the response rate to establish whether the data captured was sufficient to enough to provide reliable results that could help make inference to the study.

Table 4.1 shows the response rate for this study.

**Table 4.1: Rate of Response**

<b>Respondents</b>	<b>Frequency</b>	<b>Percent</b>
Responded	40	90.9
Not Responded	4	9.1
<b>Total Sample size</b>	44	100

Source: Research Data (2019)

The sample size for this study was 44 managers from commercial banks in Kenya. As illustrated by the above table, a response rate of 90.9% was realised in time for analysis



from the 40 positive responses out of the 44 requests made. Mayfair Bank, Development Bank, Imperial Bank (in receivership) and Middle East Bank Kenya did not respond. This rate of response was deemed fit for the study to derive inferences on the study objectives as argued by Mugenda and Mugenda (2003).

### **4.3 Background Information**

The study participant’s background information is captured under this section. The information captured includes their designation in the bank, their level of education, how long they have worked for the bank and which bank department they represent. This information was deemed relevant as it reflects level of understanding of the participants within their environments.

#### **4.3.1 Designation in the company**

Job descriptions for the participants for the study was captured to gauge the reliability of this information given their various levels on influence in the organization. Senior managers in IT for example would be perceived to be better placed to give reliable information as opposed to clerical staff in Marketing department.

**Table 4.2: Designation in the Company**

<b>Designation</b>	<b>Frequency</b>	<b>Percent</b>
IT Support Staff	12	30
IT Manager	21	52.5
Technical Business Analyst	4	10

Operations Manager	2	5
ICT Procurement Manager	1	2.5
<b>Total Sample size</b>	40	100

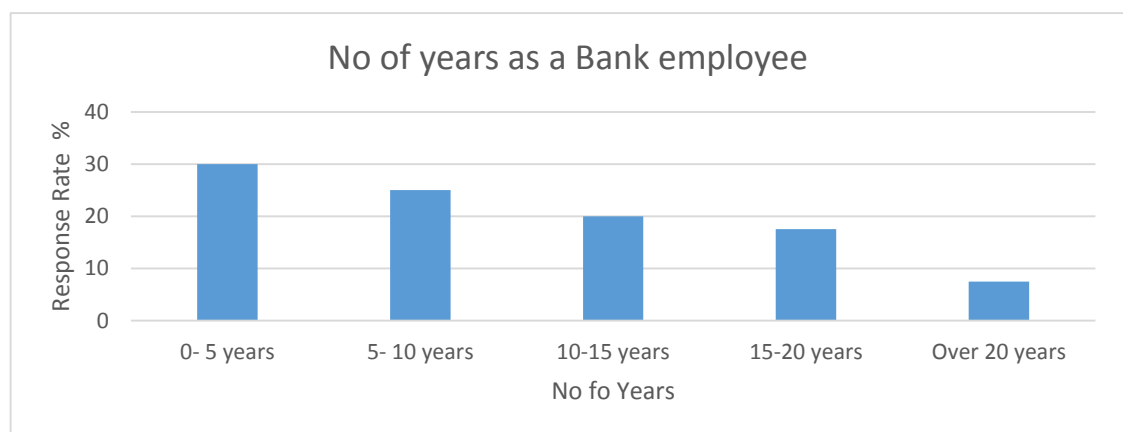
Source: Research Data (2019)

From Table 4.2, it can be observed that 95% of the participant were directly in IT i.e. IT managers, their support staff, the technical business analyst and ICT procurement buyer. The two operation managers were users who also happen to interact with the same information systems. This ensured that the target participant were well placed to give data that would be effectively used to establish and make inferences to this study.

#### 4.3.2 Work Period of Participant in the Organisation.

The participants were asked to indicate how long they have worked in the organization. This was to establish the veracity of the information around collaboration with specific Fintechs during the periods of collaborations as indicated in Figure 4.1.

**Figure 4.1**



Source: Research Data (2019)

The study findings in Figure 4.1 shows that a substantial number (70%) of participants indicating that they had served their respective organisations for over five year and above. Only 30% of the participants indicated that they had been in their organisations for 0-5 years. Even amongst these, a substantial number had done above two years. This is a substantial amount of time for one to understand which fintech companies have collaborated with their organisation, how these collaborations have been realised and in the least form an informed view of how the same collaborations have affected their operational efficiency and performance. All participants were also noted to be of graduate level and above.

### 4.3 Bank- Fintech Collaborations

#### 4.3.1 Perception on Bank – Fintech Collaborations

**Table 4.3: Perception of Bank- Fintech Collaboration**

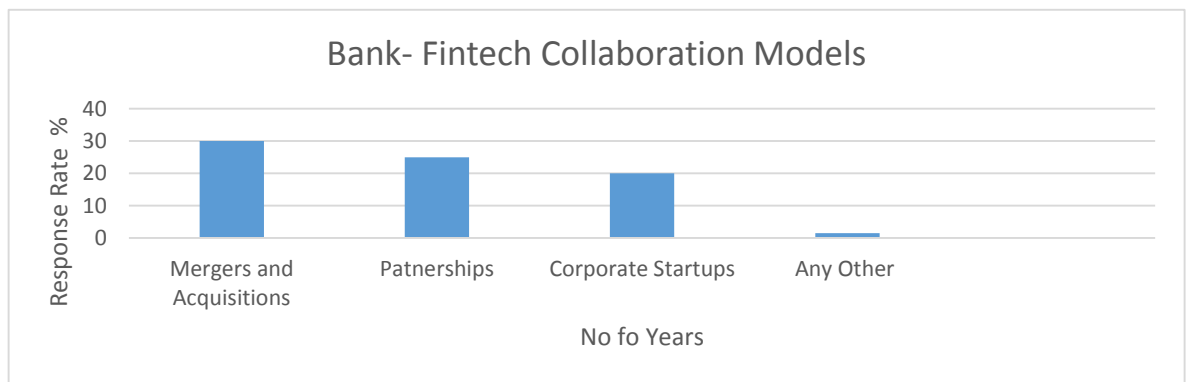
<b>Respondents</b>	<b>Frequency</b>	<b>Percentage</b>
Not Important	1	2.5
Slightly Important	4	10
Important	6	15
Very Important	29	72.5
<b>Total Sample size</b>	<b>40</b>	<b>100</b>

Source: Research Data (2019)

From the Table 4.3, we note that 72.5% of the respondents felt that Bank – Fintech collaborations were very important, 15% slightly important, 10% Important and 1% important. This was a good premise for the study, as it would ensure that the participants had bought into the corporate strategies of their banks around fintech collaborations. Their veracity of their input would thus been perceived as properly comprehensive.

### 4.3.2 Bank – Fintech Collaborations Model

**Figure 4.2**



Source: Research Data (2019)

Figure 4.2 speaks to the various models the bank and fintech had collaborated. This was across collaborative areas. 30 % of Fintechs Collaborations were through Mergers and Acquisitions, 25% on Partnerships 20 % through corporate startups and internal development. In addition, 1% was operational cheques clearing systems as captured by the various banks. Important to note was 55% was on Mergers and Acquisitions and Partnerships. This might be due to the short amount of time to realise collaborations for

effective go to market strategies. The 20% on corporate startups were majorly from the big tier one banks with long-term digital strategies.

#### 4.3.2 Bank – Fintech Collaborations Areas

Data was collated from the questionnaires and tabulated to capture the fintech collaborating with respective banks, the period (in years) of these collaborations and whether these collaborations met the four criteria of input and output variables of the intermediation dimension as captured in Table 3.3 for DEA Analysis.

**Table 4.4: Bank- Fintech Collaboration Areas.**

<b>BANK</b>	<b>FINTECH</b>	<b>PRE FINTECH</b>	<b>POST FINTECH</b>	<b>M1</b>	<b>M2</b>	<b>M3</b>	<b>M4</b>
ABC Bank (Kenya)	None			N	N	N	N
Bank of Africa	B Mobile (No Loan Module)	2009 - 2018	2018	Y	N	N	N
Bank of Baroda	BOB Kenya mpassbook. (No Loan Module)	2009- 2016	2016-2018	Y	N	N	N
Bank of India	Fintech Group			N	N	N	N
Barclays Bank of Kenya	Barclays Bank App- (Timiza) (No Loan Module)	2009 - 2018	2018	Y	N	N	N
Citibank	Fintech Group Eclectics International			N	N	N	N
Commercial Bank of Africa	Mshwari	2009- 2012	2012- 2018	Y	Y	Y	Y
Consolidated Bank	None			N	N	N	N

Cooperative Bank of Kenya	MCoopcash Eclectics International PayPal Jambo Pay Chamasoft Litemore limited Mobile and Web App Solutions Center. Cellulant Onfon Media Itesyl Limited Switchlink Africa. Sybrin Eclectics International	2009-2014	2015-2018	Y	Y	Y	Y
Credit Bank	None			N	N	N	N
Diamond Trust Bank	DTB 24/7 – DTB Africa Sybrin Kenex Netcoms Isolutions Magenta PurplrFire Cellulant Africa no loan module	2018		Y	Y	Y	Y
Dubai Islamic Bank	DIB Mobile Banking- Craft silicon			Y	Y	Y	Y
Ecobank Kenya	Eco bank mobile – Cellulant (No Loan Module)	2016		Y	N	N	N
Equity Bank	Equitel - Easy Pay			Y	Y	Y	Y
Family Bank	Pesa Pap	2012		Y	Y	Y	Y
First Community Bank	None			N	N	N	N
GTB	GT Bank Mobile	2016		Y	Y	Y	Y
Guardian Bank	None						
GIRO Commercial Bank	None						
Gulf African Bank	GAB Pesa	2017		Y	Y	Y	Y
Housing Finance Company of Kenya	HF Whiz – HFC LTD	2018		Y	Y	Y	Y
I&M Bank	I&M Mobile- Craft Silicon (No Loan Module)	2016		Y	N	N	N

Jamii Bora Bank	Jamii Bora Mobile- Craft silicon	2014-2018		Y	Y	Y	Y
Kenya Commercial Bank	Mpesa, Kocella Limited Eclectics International Huawei Ingenico Manam Tech Temenos Amplitude			Y	Y	Y	Y
NBK	Natmobile App			Y	Y	Y	Y
NIC Bank	NIC Mobile – Craft silicon	2014		Y	N	N	N
Oriental Commercial Bank	None						
Paramount Universal Bank	None						
Prime Bank (Kenya)	Fintech Group Prime mobi	2014		Y	Y	Y	Y
SBM Bank Kenya Limited	Mfukoni SBM limited -			Y	Y	Y	Y
Sidian Bank	Sidianvibe – kept Loan module available)	2015		Y	Y	Y	Y
Spire Bank	Spire Go Mobile- Modfinserver (no loan module)	2014		Y	N	N	N
Stanbic Bank Kenya	Standard bank mobile app- in-house (No Loan Module)			Y	N	N	N
Standard Chartered Kenya	Mpesa Alipay We chat pay Mobilife Kenya	2018		Y	Y	Y	Y
Trans National Bank Kenya	Fintech Group TNB Mobile (No Loan Module)	2018		Y	N	N	N
United Bank for Africa	UBA Mobile Banking- Modfinserver (no loan module)	2015		Y	N	N	N

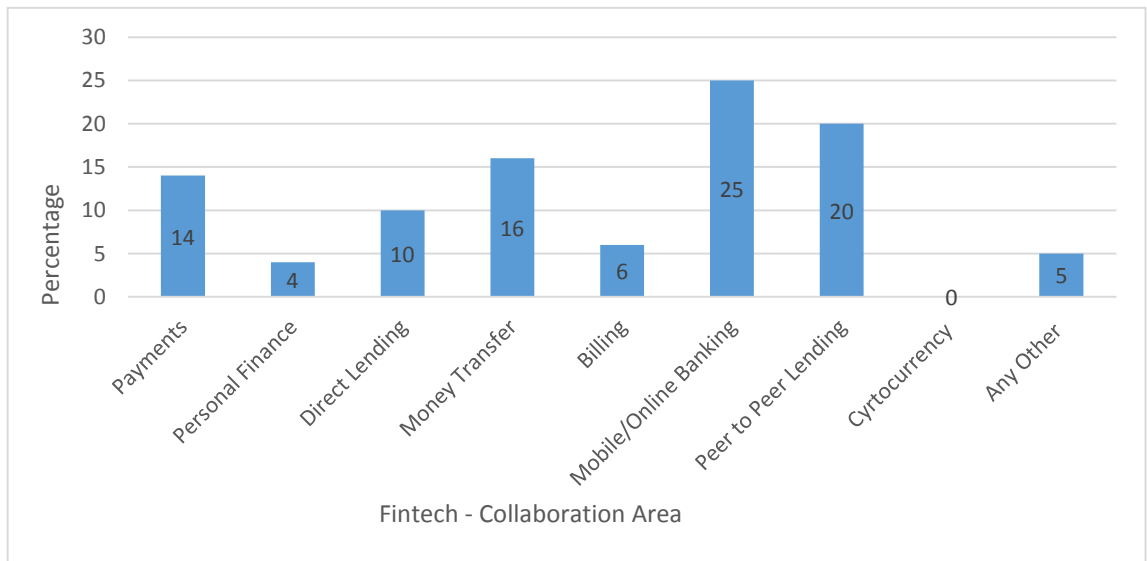
Victoria Commercial Bank	None						
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Source: Research Data (2019)

Legend: Y- Conforms to intermediation model. N- Does not conform to intermediation model.

From the above; from the above, 9 banks of the total effective sample size of 40 did not meet the all the intermediation criteria of models M1, M2, M3 and M4 (Table 3.3). 15 more banks only met intermediation model M1. Consequently, only 16 Banks formed a proper premise to measure the technical performance of the bank fintech collaborations as objectified by this study. However, the 31 banks where Fintech collaborations were noted would equally form a strong premise to measure the extent and areas of bank fintech collaborations as illustrated in Figure 4.3

**Figure 4.3 Fintech - Collaboration Areas**



Source: Research Data (2019)

The 16 Banks that met this study’s DEA Intermediation model and those that could effectively be used for the pre Fintech and Post Fintech were as tabulated in Table 4.



### 4.3.2 Summary of secondary DEA models data

Secondary data that would be vital in the computation of the technical efficiencies for the various DEA intermediation Models as captured in table 3.3 was obtained from various published financial statements from the sixteen banks. An average for each variable was then, computed for every bank for both the pre fintech and post fintech times as guided by feedback gotten from the questionnaires for computation of the several Technical efficiencies.

Below is a summary of this secondary data.

#### Pre Fintech Period

Variable	CBA	Co-op	DTB	DIB	Equity	Family	GTB	Gulf
Deposit	23,986,396	134,359,493	251,431	2,610,309	166,068,456	27,943,360	27,594,711	12,969,806
Interest Income	5,243,846	16,875,486	547,689	6,320	43,171,362	5,354,441	3,696,662	1,548,671
Interest expense	3,108,995	2,638,132	3,235,893	8,909	9,249,984	904,040	1,322,438	262,664
Loans	21,639,691	154,339,991	188,413	1,181,421	203,206,216	34,582,587	19,606,520	10,665,498

Source: Respective Banks published financial statements for various years

Variable	HFCK	Jamii	KCB	NBK	Prime	SBM	Sidian	Stanchart
Deposit	34,720,824	5,382,621	120,467,051	56,728,163	40,562,029	307,857	9,164,983	140,524,846
Interest Income	6,045,521	1,214,831	17,968,455	6,457,997	5,022,621	1,263,233	1,913,418	19,375,477
Interest expense	3,779,848	1,127,221	3,499,734	1,376,887	2,502,676	394,024	515,280	5,633,275

Loans	43,186,287	8,310,978	162,544,539	28,068,218	25,530,436	7,659,671	8,693,764	58,016,010
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Source: Respective Banks published financial statements for various years

### Post Fintech Period

Variable	CBA	Co-op	DTB	DIB	Equity	Family	GTB	Gulf
Deposit	36,740,085	147,360,141	283,065	5,250,614	177,280,800	50,163,555	26,371,497	15,789,505
Interest Income	5,634,468	12,140,640	903,525	123,603	51,841,536	10,810,919	4,445,060	1,915,307
Interest expense	3,993,892	4,505,915	6,071,562	33,517	10,027,745	4,111,868	1,625,975	363,369
Loans	31,091,347	168,311,639	190,777	3,305,354	279,746,782	41,395,232	20,542,673	13,790,646

Source: Respective Banks published financial statements for various years

Variable	HFCK	Jamii	KCB	NBK	Prime	SBM	Sidian	Stanchart
Deposit	36,660,581	8,095,100	227,721,781	55,191,425	45,075,045	342,414	12,065,178	154,720,011
Interest Income	7,132,626	1,910,861	41,613,399	8,430,119	5,837,392	1,092,515	2,413,764	21,526,288
Interest expense	4,156,258	664,967	8,629,112	3,655,325	2,848,182	485,616	753,312	5,125,232
Loans	49,368,686	9,356,471	305,659,189	28,346,668	33,422,476	7,096,825	10,453,714	131,965,961

Source: Respective Banks published financial statements for various years

### 4.3.3 Results and Discussions

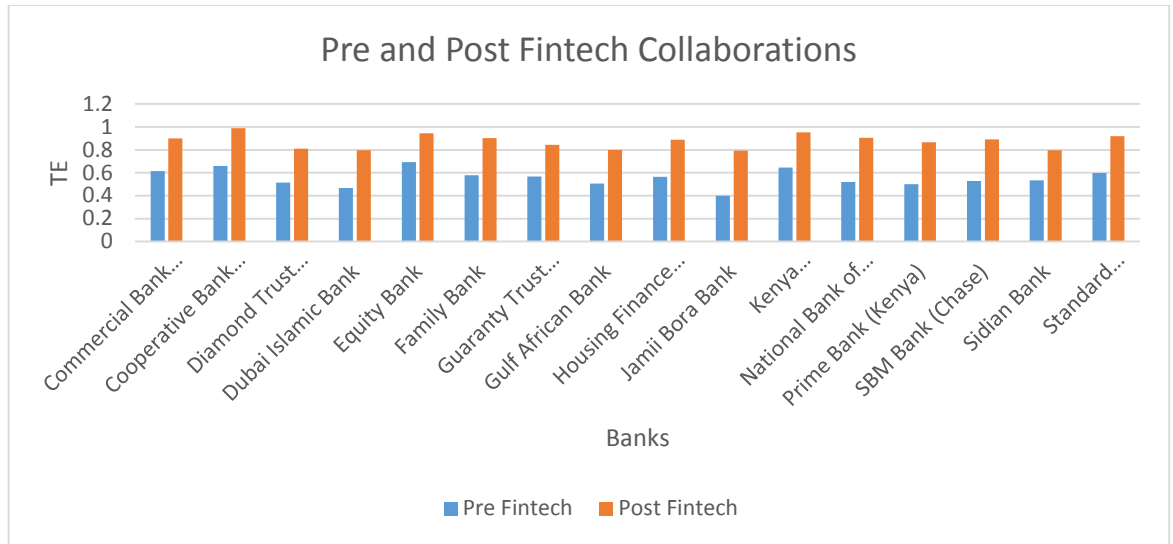
**Table 4: Sample size based on intermediation models adherence.**

	PRE FINTECH				POST FINTECH			
BANK	M1	M2	M3	M4	M1	M2	M3	M4

Commercial Bank of Africa	0.757	0.614	0.730	0.746	0.898	0.773	0.865	0.998
Cooperative Bank of Kenya	0.874	0.658	0.723	0.758	0.989	0.775	0.850	0.992
DTB	0.799	0.514	0.599	0.667	0.809	0.647	0.705	0.919
DIB	0.732	0.467	0.582	0.603	0.797	0.543	0.699	0.912
Equity Bank	0.839	0.693	0.694	0.736	0.945	0.729	0.716	0.991
Family Bank	0.795	0.578	0.606	0.702	0.903	0.623	0.687	0.843
GTB	0.784	0.567	0.537	0.591	0.842	0.534	0.645	0.899
Gulf African Bank	0.731	0.506	0.602	0.537	0.798	0.541	0.701	0.846
Housing Finance (HFCK)	0.797	0.564	0.612	0.737	0.887	0.592	0.748	0.920
Jamii Bora Bank	0.706	0.399	0.515	0.757	0.792	0.437	0.609	0.801
Kenya Commercial Bank	0.830	0.646	0.689	0.763	0.953	0.699	0.756	0.946
NBK	0.801	0.521	0.641	0.697	0.905	0.587	0.742	0.867
Prime Bank (Kenya)	0.765	0.501	0.589	0.754	0.867	0.563	0.679	0.928
SBM Bank (Chase)	0.792	0.527	0.578	0.665	0.891	0.609	0.689	0.888
Sidian Bank	0.701	0.534	0.549	0.739	0.796	0.599	0.656	0.914
Standard Chartered Kenya	0.825	0.598	0.621	0.767	0.920	0.648	0.732	0.974
<b>Average</b>	<b>0.783</b>	<b>0.555</b>	<b>0.617</b>	<b>0.701</b>	<b>0.874</b>	<b>0.619</b>	<b>0.717</b>	<b>0.914</b>
<b>Max</b>	<b>0.874</b>	<b>0.693</b>	<b>0.730</b>	<b>0.767</b>	<b>0.989</b>	<b>0.775</b>	<b>0.865</b>	<b>0.998</b>
<b>Min</b>	<b>0.701</b>	<b>0.399</b>	<b>0.515</b>	<b>0.537</b>	<b>0.792</b>	<b>0.437</b>	<b>0.609</b>	<b>0.801</b>

The above four models M1, M2, M3 and M4 represented the intermediation dimension. These models best reflected the essential functions of banks in the financial system: to be the financial intermediaries, which leads to reallocation of funds among the participants in the financial system.

**Figure 4.4 Pre and Post Fintech – Collaboration TE Summary**



Source: Research Data (2019)

As illustrated above, Banks during the Pre Fintech periods had lower technical inefficiencies as compared to their respective Post Fintech Periods. Thus, Fintech collaborating banks were noted to be better able to utilize loans to interest income, interest expenses to deposits and interest expenses to interest income. Cooperative Bank, Equity Bank KCB realised a bigger TE score as compared to the others. This might be because they also had a relatively higher number of fintech engagements as compared to the others.

## **CHAPTER FIVE: SUMMARY CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 Introduction**

Findings, conclusions and recommendations of the study are captured under this chapter. In this section, inferences are made to the specific study objectives and on the entire research study. Recommendations on further studies and policy frameworks are also outlined here.

### **5.2 Summary**

The study established that most of the banks corporate strategies' were tailored towards adopting digital platforms anchored on fintech outlooks. This could be noted from responses gotten from the managerial respondents, over 90% of whom affirmed importance of bank fintech collaborations in their various organisations. This view is further entrenched by the models of adoptions of these fintech firms where it was noted a substantial percentage preferred Mergers, acquisitions, and partnerships as a collaborating model. This might have been due to these models support of faster go to market strategies as every bank seeks to gain a competitive edge. The bigger banks were also noted to incorporate 20% of collaboration models as corporate startup and in-house development of fintech capability as long-term strategies.

This study also established that the banks have collaborated with Fintechs across various fronts with the highest percentage of 50% being on Mobile, Online and Direct Lending.

This was a noted trend across most banks in the system, most of the mobile solutions not only used to facilitate utility payments and day-to-day transaction but also offering loan facilities through mobile technology. Perhaps in a bid to compete with Fintechs such as Tala, Branch and other banks offering similar services in a more efficient way.

Other areas of significant collaborations were on payments and operations. There was no sighted collaborations of the cryptocurrency front at all also affirming Banks limitation to trade in virtual currencies by the regulator.

### **5.3 Conclusions**

Over the past ten years, there has been a sustained trend amongst Kenyan commercial banks to engage emerging Fintech companies and collaborate with them for operational efficiency and to ultimately gain a competitive edged and wider market share for respective banks. These collaborations have been on various fronts with the highest percentage being on mobile banking and lending. Banks in Post Fintech collaborating times were more technically efficient on all four intermediation models as compared to pre Fintech collaborating times. Though no result captured technical efficiency coefficient of 1, there was however notable incremental values of efficiency coefficients from pre fintech periods to post fintech periods. This, therefore points to Bank – Fintech collaborations having a significant impact on bank’s technical performance.

### **5.4 Recommendation of the Study**

This study recommends that banks continuous review with the aim to rescaling their scope of operations to optimize the operational space to levels that guarantee technical efficiencies. All industry players and the regulator to formulate a regulatory framework that realizes a mature financial ecosystem between the two parties for a mutually beneficial engagement.

### **5.5 Limitation of the Study**

Challenges were faced during the data collection exercise where managers sighted busy schedules and had to be reminded repeatedly to review and fill the questionnaires. Some did not want to list and/or give information around fintech partnerships for fear of divulgence of information that they deemed strategic leaking to the competitor's hands. To address these two issues the researcher had to hold several meetings with the respondents and explain to them the objectives of this study. He assured them off confidentiality of the same information, the ethical procedures used to obtain the same, and that this information was for academic purposes only. Another limitation to this study was the relatively small number of banks in at the final stage of analysis after dropping the four that did not have responses and the ones that did not meet the DEA models outlook.

### **5.5 Suggestion for Future Studies**

A small number of banks affect the number of inputs and outputs that can be used to estimate the level of efficiency. Consequently, it would be useful for future research to use more input and output models to increase the number of analyzed parameters. The more

the Decision Making Units for the DEA the better the approximation of technical efficiencies computation for the bank.



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## **APPENDICES**

### **Appendix I: Commercial Banks in Kenya.**

1. ABC Bank (Kenya)
2. Bank of Africa
3. Bank of Baroda
4. Bank of India
5. Barclays Bank of Kenya
6. Chase Bank Kenya (In Receivership)
7. Citibank
8. Commercial Bank of Africa
9. Consolidated Bank of Kenya
10. Cooperative Bank of Kenya
11. Credit Bank
12. Development Bank of Kenya
13. Diamond Trust Bank
14. Dubai Islamic Bank
15. Ecobank Kenya
16. Equity Bank
17. Family Bank
18. First Community Bank
19. Guaranty Trust Bank Kenya
20. Guardian Bank
21. GIRO Commercial Bank
22. Gulf African Bank
23. Habib Bank AG Zurich
24. Housing Finance Company of Kenya
25. I&M Bank

26. Imperial Bank Kenya (In receivership)
27. Jamii Bora Bank
28. Kenya Commercial Bank
29. Mayfair Bank
30. Middle East Bank Kenya
31. National Bank of Kenya
32. NIC Bank
33. Oriental Commercial Bank
34. Paramount Universal Bank
35. Prime Bank (Kenya)
36. SBM Bank Kenya Limited
37. Sidian Bank
38. Spire Bank
39. Stanbic Bank Kenya
40. Standard Chartered Kenya bb
41. Trans National Bank Kenya
42. United Bank for Africa
43. Victoria Commercial Bank

**Source: Central Bank of Kenya Annual Bank Supervision Report**

**Appendix II: List of Fintechs.**

1. 3G Direct Pay Group
2. Abacus
3. BambaPos
4. Beyonic
5. BitPesa
6. Bitsoko
7. Branch
8. Caytree Financial
9. Cellulant
10. Chura
11. Buy airtime service

12. Mass airtime service
13. PayPal to Mpesa
14. Mpesa to PayPal
15. Chura Remit
16. Chura Virtual Card
17. ConnectAfrica
18. Direct Pay Online
19. Eastpesa
20. Eclectics International
21. Esacco
22. FarmDrive
23. Forex
24. GrassRoots Bima
25. iNuka Pap
26. JamboPay
27. Jumo
28. Kipochi
29. Kopo Kopo
30. Kwanji
31. Lakt
32. LelapaFund
33. Lipisha
34. M-Changa
35. M-Pesa
36. Musoni
37. Nomanini
38. Packline Systems
39. PesaPal
40. Remit
41. Tala
42. Tangazoletu
43. Umati Capital

**Source: <https://gomedici.com/fintech-companies-kenya-2017>**

### Appendix III: Questionnaire Guide

This questionnaire is used to collect data purely for academic purposes. The study seeks to evaluate the effects of Bank- Fintech Collaboration in your organization.

Information gathered will be strictly confidential.

*Answer questions as indicated by either filling in blanks or ticking the option that applies.*

#### A. Background Information On Respondents

1. Which level of management are you in .....

2. What period have you worked for the Bank?

- a) 0- 5 years [ ]
- b) 5-10 years [ ]
- c) 10-15 years [ ]
- d) 15-20 years [ ]
- e) Over 20 years [ ]

3. What academic qualifications do you currently have?

- a) Diploma [ ]
- b) First Degree [ ]
- c) Master's Degree [ ]
- d) PhD [ ]



4. Which department do you serve in .....

**B. Bank-Fintech Collaborations.**

1. How important does the organisation, perceive Bank- Fintech collaborations?

- a) Not Important [ ]
- b) Slightly Important [ ]
- c) Important [ ]
- d) Very important [ ]

2. Which of the below listed focus areas has your organisation adopted Fintech services?

- a) Payments [ ]
- b) Personal Securities [ ]
- c) Direct lending [ ]
- d) Money Transfer [ ]
- e) Billing, Automation and Streamlining [ ]
- f) Online/ Mobile Banking [ ]
- g) Peer to Peer lending [ ]
- h) Cryptocurrency [ ]
- i) Any Other [ ]

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3. Which year were these Bank- Fintech collaboration in (6) above realised in your organisation?

<b>Fintech Focus Area</b>	<b>Year Engaged</b>	<b>Fintech Name (Optional)</b>
Payments		
Personal Securities		
Direct lending		
Money Transfer		
Billing, Automation and Streamlining		
Online/ Mobile Banking		
Peer to Peer lending		
Cryptocurrency		
Any Other		

4. What collaborative Bank -Fintech model did your organisation adopt?

- a) Partnerships
- b) Mergers and acquisitions
- c) Corporate start up engagement programmes
- d) Any Other

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5. What factors were considered by the bank in adopting these Bank-Fintech collaborative models?

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